



HART Operation Manual







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Introduction

This manual describes the ST100 HART protocol 7.3 features, its operation and configuration. The ST100 can provide up to 4 different process variables. It provides Flow, Temperature, Flow Totalizer, and Pressure, as outputs. The flow output can be selected as Volumetric, Mass or Velocity units. The ST102 and ST112 can support up to two flow sensors and provides the average flow of the two sensors in a single output.

This documents is written to be used with all members of the ST100 product family configured with the HART 7.3 communication Protocol.

The HART output is provided through an extension card that is fully integrated into the ST100 instrument.

Definition

Universal HART Commands

A collection of commands that must be supported by all HART compatible devices. The Universal Command Specification establishes the minimum Application layer support required of all HART devices. The Application layer defines the commands, responses, data types and status reporting supported by the Protocol.

Common Practice HART Commands

A collection of commands applicable to a wide range of devices. These commands shall be supported by devices whenever possible. The HART Common Practice Commands enhances interoperability by providing additional standardized, device-independent commands.

Device Specific Commands

Commands defined by the manufacturer according to the need of the Field device. The manufacturer of the Field device controls these commands. The FCI ST100 family of products has 20 manufacturer specific commands.

EDDL/DD Files

Text files interpreted by the host system. The EDDL file is a file that tells the host what functionality the device (ST100) has, and how the functionality is invoked. The EDDL also tells the host to do common maintenance functions such as calibration, configuration check status of individual sensors, change engineering units, etc.

FCI Configurator

A PC software tool that gives access to the ST100 functions and features. It facilitates basic instrument setup and configuration, as well as advance functions. The FCI configurator can interface through the ST100 USB Service port or the Ethernet Service port.

Installation

General

For details on the general mounting, placement of sensor head and mounting options see the Basic User Manual, 06EN003400.

Electrical Wiring

Access the wiring terminal block by removing the rear electrical connection cover. This cover can be locked closed by the cover locking screw. Release the cover locking screw and remove the cover.

Cable access to wiring connections is obtained through one of the four conduit outlets, see Figure 6 below.



Figure 6 - Instrument Wiring

The HART connections for the ST100 are located in the back panel. The connector for the HART is P1A; the pins are labeled "CH1" and "RTN 1/2". The ST100 HART connections are non- polarized, but polarity needs to be observed for other manufacturer's devices. Connect the HART bus cable as noted below. See Appendix A for Channel 1 HART connections on instruments shippped before April 2012.



Figure 1 - HART Output Wiring Table



Figure 2 - Detail Internal Power Supply connection for Non-Network



Figure 3 - Detail External Power Supply connection for Non-Network

Topology and Network Configuration

The ST100 supports Multidrop topology. In multidrop operation, the devices exchange data and measured values only via the HART protocol/HART Network. In Network configuration the analog current signal serves just to energize the two-wire devices, providing a current of 4 mA per instrument.

In multidrop mode, up to 15 field devices are connected in parallel to a single wire pair or segment (Figure 4). The host distinguishes the field devices by their preset addresses that range from 1 to 255. The factory preset address is 0.



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Figure 4 - Multidrop Mode with HART Transmitters

Operation

Functional Description

The primary function of the HART protocol is to present the instruments process data through its process data commands. Command 1, command 3 and command 9.

The ST100 does not implement the HART Burst mode. A HART master that supports HART 7.0 and higher is required. A HART communicator that supports HART 7.0 and higher is required (e.g., Emerson 475 Communicator.)

Process Data Operation

Even though HART 7.0 is compatible with older versions of the HART protocol, the ST100 HART implementation and commands 1 and 3 are still supported, they contain the Flow Variable only, for the full set of Dynamic variables it is recommended that the HART master use command 9 to request process data of dynamic variables and status.

ST100 HART Process Data Organization

It is important to briefly review how the ST100 Process data is organized under the HART command 9. For Details on Command 9 see the HART Specification "Universal Commands Specification" HCF_SPEC-127, Revision 7.1.

Not all the variables described in this section are available in all configurations of the ST100 flow meter. For example not all configurations have Process Pressure, and instruments that output Mass Flow or Volumetric flow, the Flow Totalizer may be turned on or off.

The following are the ST100 process variables that are provided through HART command 9.

There are 3 flow classes or types, and these are "Exclusively OR" meaning that only one class of flow is active at a time.

PROCESS VARIABLE	SLOT #	HART VARIABLE CODE DESCRIPTION	DEVICE VARIABLE CODE	DEVICE VARIABLE CLASSIFICATION
VOLUMETRIC FLOW *	0	PRIMARY VARIABLE	0	66
MASS FLOW *	2	PRIMARY VARIABLE	2	72
VELOCITY FLOW *	4	PRIMARY VARIABLE	4	67
VOLUME (TOTALIZER)	1	SECONDARY VARIABLE	1	68
MASS (TOTALIZER)	3	SECONDARY VARIABLE	3	71
TEMPERATURE	5	TERTIARY VARIABLE	5	64
PRESSURE	6	QUATERNARY VARIABLE	6	65

* Implies an "Exclusive OR" Releationship

Under the "Device Variable Status" parameter, for each process variable, only the four most significant bits are used.

The two most significant bits contain

"Process Data Status":

11 = good 01 = Poor Accuracy 10 = manual/fixed 00 = bad

The two bits after the two most significant contain

"Limit Status":

11 = constant 01 = low limited 10 = high limited 00 = not limited

Device variable status example: 1100XXXX.X, variable values indicated in positions represented by an 'X' can be ignored.

Device Description Files

EDDL Files

TThe ST100 EDDL files are support files that provide an extended description of each object in the Virtual Field Device (VFD), and provide information needed for a control system or host to understand the meaning of the data in the VFD including the human interface. The EDDL file can be thought as a "driver" for the device.

FCI provides two types of files; first the standard EDDL files located in the folder A67F0101, and the Emerson 375 and 475 files located in the folder DDP.

A67F0101Folder:

DDP Folder:

0101.fm8 A67F0101.ddl 00A67F0101.hdd 00A67F0101.hhd 0101.fm8 A67F0101.ddl

Loading the DD Files to the 475 Field Communicator

In order to load the DDPs into the Field Communicator the "Easy Upgrade Utility from EMERSON must be used. Below is the procedure for how to load DD files into the 475-Field communicator.

Open Field Communicator Easy Upgrade Utility program and click Utilities on the left hand menu; select Import DDs from local source. The following window should pop up:

K Field Communicator Easy Upgra	ide Utility 3.5			
Upgrade Licensing & Registration	Utilities		Select path to DD files	
Utilities	months		Location C:\FCMedia\SDIN\HART\DD	Browse
Settings	Import DDs fro	om a local source	HART: Fluid Components International FCI Model XXX Rev 1 DD 1 (en) HART Communication Foundation Sample 1 Rev 1 DD 1 (en)	
Website	Print HART cor	nfigurations		
	Refresh conne	ected card		
	Repair card			OK Cancel
Sector & Carl				

Select the FCI files and press "OK".

Service Data Operation

The Service Data functions are organized into 3 areas:

- 1. ST100 Basic Setup
- 2. ST100 Configuration
- 3. ST100 Factory Calibration Limits

The service information is presented here as seen through the 475 HART communicator, with FCI's EDDL files loaded. The same information seen by the 475 is shown in the DCS when the ST100 HART EDDL files are loaded.



ST100 Basic Setup

The Basic Setup function includes the ability to review and change the engineering units of the process variables, review and change the Plenum or pipe size, enable or disable the Totalizer, review and change device information, reset the operation of the ST100 to the factory settings, enable or disable the write protect, and PV Setup.



Engineering Units Information



Factory Reset

WARNING

The factory Reset command re-loads the configuration and calibration parameters that were loaded into the instrument during the original cal and setup. Any changes made to the configuration of calibration parameters will be lost when the Factory Reset command is executed.

ST100 Configuration

The configuration functions facilitate the setup of the individual 4 - 20 mA current output channels.



ST100 Calibration Limits (example)

The ST100 Calibration Limits function provide you with the ability to review the limits that have been set for each of the following process parameters: Flow, Temperature, and Pressure.

Setting the ST100 for the HART Protocol Operation

Note: If the ST100 was ordered as a 4-20 mA analog current output or a HART device, the factory will have configured the instrument for HART operation, and it should not be necessary to do any instrument configuration.

The ST100 PC Configurator tool is used to select the communication protocol with instrument power ON. In normal operating conditions, connect the PC with the configurator software to the ST100 USB port using FCI's cable (P/N 022646).



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Figure 5 - Communication via the USB Port

To configure the ST100 for HART open the ST100 Configurator **P**. From the tree menu, on the left side select "Configuration", and then select the "Output" tab. In the Output tab select "Analog Output Board" and then select "4-20mA channel #1 as HART". Verify the 4-20mA range values meet the process requirements. Then press the "Send to Device" button to download the setting to the ST100 instrument.

<u></u> ST100	Configuration
Process Data Basic Setup Advanced Setup Configuration Diagnostics Factory	Output 4-20mA User Modbus Image: Analog Output Board (4-20mA, Frequency, Pulse & HART)
Factory → Factory → FE1 → Parameter Reports → Group 1 → Group 2 → Group 3 → Group 4 → Group 5	Analog Output Selection 4-20mA #1: HART (Flow) 0 3650 4-20mA #2: Temperature 0 150 4-20mA #3: Temperature 0 150 Frequency: Off Range: Pulse: Tot Row on CH2 (sou X 1.0

ST100 HART Command List

- The ST100 HART commands are divided into three classes.
- Universal Commands
- Common Practice Commands
- Device Specific Commands

ST100 HART Universal Commands

The ST100 HART supports Universal Commands 0 through 22. Commands 4 and 5 are reserved under Universal Command Specification Rev. 7.1 (HCF_SPEC-127, Revision 7.1) and not implemented in this specification. There is no HART command 10.

HART COMM NUMB.	HART COMMAND DESCRIPTION	HART DATA TYPE & SIZE
	READ UNIQUE IDENTIFIER -	
	"254"	"254"
		UNSIGNED-8
	EXPANDED DEVICE TYPE	EXPAND DEV TYPE
		ENUM (2 BYTE)
	MINIMUM PREAMBLES - REQUEST	MIN # PREAMBLES
		UNSIGNED-8
	HART PROTOCOL MAJOR REV	HART PROTOCOL REV.
		UNSIGNED-8
	DEVICE REVISION LEVEL	DEV. REV LEVEL
		UNSIGNED-8
	DEVICE SOFTWARE REVISION LEVEL	SOFTWARE REV. LEVEL
		UNSIGNED-8
	ELECTRONICS REVISION LEVEL (HARDWARE)	ELECTRONICS REV. LEVEL
		UNSIGNED-8
	PHYSICAL SIGNALING CODE	STAK SOFT. REV
0	CODE 0 = BELL 202 CURRENT	ENUM (1 BYTE)
0	FLAGS	FLAGS
	CODE 01 = MULTI SENSOR	ENUM (1 BYTE)
	DEVICE ID	DEV. ID NUMB.
		UNSIGNED-24
	MINIMUM PREAMBLES - RESPONSE	
		UNSIGNED-8
	MAXIMUM # OF VARIBLES	MAX # VARIABLES
		UNSIGNED-8
	CONFIGURATION CHANGE COUNTER	CONFIG CHANGE COUNT
		UNSIGNED-16
	EXTENDED FIELD DEVICE STATUS	
		UNSIGNED-8
	MANUFACTURER ID CODE	
	FCI CODE = 166 DEC (00A6)	ENUM (2 BYTES)
	PRIVATE LABEL DIST. CODE	
		ENUM (2 BYTES)
	DEVICE PROFILE CODE	
		ENUM (2 BYTES)

HART COMM NUMB.	HART COMMAND DESCRIPTION	HART DATA TYPE & SIZE
	READ PV VARIABLE (FLOW	PV UNITS CODE
1	UNITS, & FLOW VALUE)	CHAR (1 BYTE)
		PV VALUE
		FLOAT (4 BYTE)
	READ PV CURRENT AND %	PV I VALUE (mA)
	RANGE	FLOAT (4 BYTE)
2		% PV VALUE
		FLOAT (4 BYTE)
	READ PV CURRENT OUT & ALL	PV I VALUE (mA)
	DYNAMIC VARIABLES	FLOAT (4 BYTE)
	FLOW UNITS	PV UNITS CODE
3		CHAR (1 BYTE)
	FLOW VALUE	PV VALUE
		(4 BYTE)
	WRITE NODE ID (WRITE	POLLING ADDRS
6	POLLING ADDRESS)	CHAR (1 BYTES)
		LOOP CUR MODE
		CHAR (1 BYTES)
	READ LOOP CONFIGURATION	POLLING ADDRS
_		CHAR (1 BYTES)
7		LOOP CUR MODE
		CHAR (1 BYTES)
	READ DYNAMIC VARIABLE	ENUM
8	CLASSIFICATIONS	(4 BYTES)
	READ DEVICE VARIABLES	
	WITH STATUS (UP TO 8 SLOTS)	
	EXTENDED FIELD DEVICE STATUS	BITMAP
	SLOT X DEV. VARIABLE CODE	UNSIGNED-8
		(1 BYTE)
9	SLOT X DEV. VARIABLE CLASS	ENUM
		(1 BYTE)
	SLOT X UNITS COD	ENUM
		(1 BYTE)
	SLOT X DEV. VARIABLE VALUE	FLOAT
		(4 BYTE)
	SLOT X DEV. VARIABLE STATUS	BITS
		(1 BYTE)
q	SLOT X DATA TIME STAMP	UNSIGNED-8
	(BYTES 65 - 68)	(4 BYTES)
	READ UNIQUE IDENTIFIER ASSOCIATED W/TAG	UNIQ. ID (TAG)
11	NOTE: SAME AS COMMAND "0" (SEE COMMAND "0")	BITSTRING (12 BYTES)

HART COMM NUMB.	HART COMMAND DESCRIPTION	HART DATA TYPE & SIZE
10	READ USER MESSAGE	DEV. ID NUMB.
12		BITSTRING (12 BYTES)
	READ TAG	TAG
		ASCII BIT STRING (6 BYTES)
10	READ DESCRIPTOR	DESCRIPTOR
13		ASCII BIT STRING (12 BYTES)
	READ DATE CODE	DATE
		ASCII BIT STRING (5 BYTES)
	READ PV SENSOR INFO	
	SENSOR SERIAL NUMBER	SENSOR S/N
		UNSIGNED-24
	LIMITS UNITS CODE - PV	LIMITS UNITS CODES
		ENUM (1BYTE)
14	UPPER SENSOR LIMIT - PV	UPPER SENSOR LIMIT
		FLOAT (4 BYTES)
	LOWER SENSOR LIMIT - PV	LOWER SENS LIMITS
		FLOAT (4 BYTES)
	MIN SPAN - PV	MIN SPAN
		FLOAT (4 BYTES)
	READ OUTPUT INFORMATION	
	ALARM SELECT CODE	ALRM SEL. CODE
		ENUM (1BYTE)
	TRANSFER FUNCTION CODE	TRN. FUNC. CODE
		CHAR (1BYTE)
	FLOW RANGE UNITS CODE	RNG UNITS CODE
		CHAR (1BYTE)
	FLOW UPPER-RANGE VAL	UP RANG VALUE
15		FLOAT (4 BYTES)
	FLOW LOWER-RANGE VAL	LO RANG VALUE
		FLOAT (4 BYTES)
	FLOW DAMPING VALUE	DAMPING VALUE
		FLOAT (4 BYTES)
	WRITE PROTECT CODE	W PROTECT CODE
		ENUM (1BYTE)
	RESERVED (SET TO 250)	RESERVED
		ENUM (1BYTE)
	READ FINAL ASSEMBLY NUMBER	
16	ASSEMBLY NUMBER	ASSEMB. #
		UNSIGNED-24
	WRITE MESSAGE	
17		
	MESSAGE	BITSTRING (24 BYTES)

HART COMM NUMB.	HART COMMAND DESCRIPTION	HART DATA TYPE & SIZE
	WRITE TAG, DESCRIPTOR, DATE	
	TAG	TAG
		BITSTRING (6 BYTES)
18	DESCRIPTOR	DESCRIPTOR
		BITSTRING (12 BYTES)
	DATE	DATE
		CHAR (3 BYTES)
	WRITE FINAL ASSEMBLY NUMBER	
19	ASSEMBLY NUMBER	ASSEMB. #
		UNSIGNED-24
	READ LONG TAG	
20	LONG TAG	LONG TAG
		BITSTRING (32 BYTES)
	READ UNIQUE INDENTIFIER ASSOCIATED WITH LONG	
21		UNIQ. ID BITSTRING (22 BYTES)
	WRITE LONG TAG	
22	LONG TAG	LONG TAG
		BITSTRING (32 BYTES)

ST100 HART Common Practice Commands

The ST100 HART supports Common Practice commands 35, 38, 40, 42, 44, 45, 46, 48, 50, and 51.

HART COMM NUMB.	HART COMMAND DESCRIPTION	HART DATA TYPE & SIZE
	WRITE PV RANGE VALUES	
		RNG UNITS CODE
		UNSIGNED-8
35	UPPER RANGE VALUE	UPPER-RNG VAL
		FLOAT (4 BYTES)
	LOWER RANGE VALUE	LOWER-RANGE VALUE
		FLOAT (4 BYTES)
20	RESET "CONFIGURATION CHANGE" FLAG	RESET CONFIG. CHANGE. FLAG
38		UNSIGNED-8
40	ENTER/EXIT FIXED CURRENT MODE (IN mA)	I MODE SELECT
40	Value =0 means exit fixed current mode	FLOAT (4 BYTES)
	PERFORM DEVICE RESET	
42		RESET INSTRUM.
		UNSIGNED-8
	WRITE PV UNITS	
44		PV UNITS CODE
		ENUM (1BYTE)
	TRIM DAC ZERO - MEASURED CURRENT CHAN #1 IN	
45	(mA)	
		TRIM_DAC_ZERO
		FLOAT (4 BYTES)
	TRIM DAC GAIN - MEASURED CURRENT CHAN #1 IN	
46		
		PEDAT (4 BTTES)
		23 BTTES
		6 DVTES
		0 61123
40		
40	STANDANIZED STATUS U	
	STANDANIZED STATUS I	1 RVTE
		1 RVTF
	STANDARIZED STATUS 2	
		1 RVTE
1		

HART COMM NUMB.	HART COMMAND DESCRIPTION	HART DATA TYPE & SIZE
	STANDARIZED STATUS 3	
		1 BYTE
10	ANALOG CHAN FIXED	
40		1 BYTE
	DEVICE SPECIFIC STATUS	
		11 BYTES
	READ DYNAMIC VARIABLE ASSIGNMENTS	
	PRIMARY DEVICE VARIABLE	1 BYTE
50	SECONDARY DEVICE VARIABLE	N/A
	TERTIARY DEVICE VARIABLE	N/A
	QUATERNARY DEVICE VARIABLE	N/A
	WRITE DYNAMIC VARIABLE ASSIGNMENTS	1 BYTE
	PRIMARY DEVICE VARIABLE	1 BYTE
51	SECONDARY DEVICE VARIABLE	N/A
	TERTIARY DEVICE VARIABLE	N/A
	QUATERNARY DEVICE VARIABLE	N/A

ST100 HART Device Specific Commands

The ST100 HART supports 20 Device Specific commands.

HART COMM NUMB.	HART COMMAND DESCRIPTION	HART DATA TYPE & SIZE
	READ TOTALIZER VALUE	
137		READ TOTALIZER
		FLOAT (4BYTES)
	READ TOTALIZER STATE	
138		READ TOT STATE
		UNSIGNED-8
	WRITE TOTALIZER STATE	
139		READ TOT STATE
		UNSIGNED-8
	READ DEVICE INFORMATION	
	DEVICE CO	DEVICE CO
		ASCII BITSTRING (10 BYTES)
140	DEVICE SERIAL NUMBER	DEVICE S/N
		ASCII BITSTRING (10 BYTES)
	DEVICE SOFTWARE VER	DEV SOFTW VER
		ASCII BITSTRING (4 BYTE)
150	WRITE FACTORY RESTORE	FACT_RESTORE
109		ENUM (1 BYTE)

HART COMM NUMB.	HART COMMAND DESCRIPTION	HART DATA TYPE & SIZE
	READ CUSTOMER ENGINEERING UNITS	
	FLOW UNITS CODE	FLOW CODE
		UNSIGNED-8
	TEMPERATURE UNITS CODE	TEMP CODE
145		UNSIGNED-8
	TOTALIZER UNITS CODE	TOTAL CODE
		UNSIGNED-8
	PRESSURE UNITS CODE	PRESS CODE
		UNSIGNED-8
	WRITE CUSTOMER ENGINEERING UNITS	
	FLOW UNITS CODE	FLOW CODE
		UNSIGNED-8
	TEMPERATURE UNITS CODE	TEMP CODE
146		UNSIGNED-8
	TOTALIZER UNITS CODE	TOTAL CODE
		UNSIGNED-8
	PRESSURE UNITS CODE (optional)	PRESS CODE
		UNSIGNED-8
	READ PLENUM INFORMATION (PIPE SIZE)	
	PLENUM HEIGHT VALUE	PIPE_HEIGHT
		FLOAT (4BYTES)
148	PLENUM WIDTH (DIAM) VALUE	PIPE_WIDTH
		FLOAT (4BYTES)
	PLENUM UNITS CODE	PIPE_CODE
		UNSIGNED-8
	WRITE PLENUM INFORMATION (PIPE SIZE)	
149	PLENUM HEIGHT VALUE	PIPE_HEIGHT
		FLOAT (4BYTES)
	PLENUM WIDTH (DIAM) VALUE	PIPE_WIDTH
		FLOAT (4BYTES)
	PLENUM UNITS CODE	PIPE_CODE
		UNSIGNED-8
150	WRITE "WRITE PROTECT" MODE	WRITE_PROT
		UNSIGNED-8

HART COMMAND DESCRIPTION	HART DATA TYPE & SIZE
WRITE (4-20mA) OUTPUT CHANNEL #1 PARAMETERS	
D/A SETTING FOR 4mA OUT	OUTZ1
	UNSIGNED-16
D/A SETTING FOR 20mA OUT	OUTF1
	UNSIGNED-16
CHANNEL #1 OUT VARIABLE	CHA_1_PRO_VAR
	UNSIGNED-8
READ (4-20mA) OUTPUT CHANNEL #1 PARAMETERS	
D/A SETTING FOR 4mA OUT	OUTZ1
	UNSIGNED-16
D/A SETTING FOR 20mA OUT	OUTF1
	UNSIGNED-16
CHANNEL #1 OUT VARIABLE	CHA 1 PRO VAR
	UNSIGNED-8
WRITE (4-20mA) OUTPUT CHANNEL #2 PARAMETERS	
D/A SETTING FOR 4mA OUT	OUTZ2
	UNSIGNED-16
D/A SETTING FOR 20mA OUT	OUTF2
	UNSIGNED-16
CHANNEL #2 OUT VARIABLE	CHA 2 PRO VAR
	UNSIGNED-8
READ (4-20mA) OUTPUT CHANNEL #2 PARAMETERS	
D/A SETTING FOR 4mA OUT	0UT72
	UNSIGNED-16
D/A SETTING FOR 20mA OUT	OUTF2
	UNSIGNED-16
CHANNEL #2 OUT VARIABLE	CHA 2 PRO VAR
	UNSIGNED-8
WRITE (4-20mA) OUTPUT CHANNEL #3 PARAMETERS	
D/A SETTING FOB 4mA OUT	011773
	UNSIGNED-16
D/A SETTING FOR 20mA OUT	OUTE3
	UNSIGNED-16
CHANNEL #3 OUT VARIABLE	CHA 3 PRO VAR
	UNSIGNED-8
ΒΕΔΠ (4-20mΔ) ΠΙΤΡΙΙΤ CHΔΝΙΝΕΙ #3 ΡΔΒΔΜΕΤΕΒS	
D/A SETTING FOR 4mA OUT	0UTZ3
	UNSIGNED-16
D/A SETTING FOR 20mA OUT	OUTE3
	UNSIGNED-16
CHANNEL #3 OUT VARIARI F	CHA 3 PRO VAR
	HART COMMAND DESCRIPTION WRITE (4-20mA) OUTPUT CHANNEL #1 PARAMETERS D/A SETTING FOR 4mA OUT D/A SETTING FOR 20mA OUT CHANNEL #1 OUT VARIABLE READ (4-20mA) OUTPUT CHANNEL #1 PARAMETERS D/A SETTING FOR 20mA OUT CHANNEL #1 OUT VARIABLE WRITE (4-20mA) OUTPUT CHANNEL #2 PARAMETERS D/A SETTING FOR 20mA OUT CHANNEL #1 OUT VARIABLE WRITE (4-20mA) OUTPUT CHANNEL #2 PARAMETERS D/A SETTING FOR 20mA OUT CHANNEL #2 OUT VARIABLE READ (4-20mA) OUTPUT CHANNEL #2 PARAMETERS D/A SETTING FOR 20mA OUT CHANNEL #2 OUT VARIABLE READ (4-20mA) OUTPUT CHANNEL #2 PARAMETERS D/A SETTING FOR 20mA OUT CHANNEL #2 OUT VARIABLE WRITE (4-20mA) OUTPUT CHANNEL #3 PARAMETERS D/A SETTING FOR 4mA OUT D/A SETTING FOR 20mA OUT CHANNEL #3 OUT VARIABLE READ (4-20mA) OUTPUT CHANNEL #3 PARAMETERS D/A SETTING FOR 20mA OUT CHANNEL #3 OUT VARIABLE READ (4-20mA) OUTPUT CHANNEL #3 PARAMETERS D/A SETTING FOR 20mA OUT CHANNEL #3 OUT VARIABLE

HART COMM NUMB.	HART COMMAND DESCRIPTION	HART DATA TYPE & SIZE
	READ BANK #1 OF SENSOR VARIABLES	
	FLOW VALUE -SENSOR #1	FLOW1_VAL
		FLOAT (4BYTES)
	TEMPERATURE VAL SENSOR#1	TEMP1_VAL
		FLOAT (4BYTES)
	PRESSURE VALUE SENSOR#1	PRESS1_VAL
		FLOAT (4BYTES)
	FLOW VALUE -SENSOR #2	FLOW2_VAL
		FLOAT (4BYTES)
	TEMPERATURE VAL SENSOR#2	TEMP2_VAL
		FLOAT (4BYTES)
	PRESSURE VALUE SENSOR#2	PRESS2_VAL
170		FLOAT (4BYTES)
	FLOW VALUE -SENSOR #3	FLOW3_VAL
		FLOAT (4BYTES)
	TEMPERATURE VAL SENSOR#3	TEMP3_VAL
		FLOAT (4BYTES)
	PRESSURE VALUE SENSOR#3	PRESS3_VAL
		FLOAT (4BYTES)
	FLOW VALUE -SENSOR #4	FLOW4_VAL
		FLOAT (4BYTES)
	TEMPERATURE VAL SENSOR#4	TEMP4_VAL
		FLOAT (4BYTES)
	PRESSURE VALUE SENSOR#4	PRESS4_VAL
		FLOAT (4BYTES)
	READ CAL FLOW LIMITS	
	FLOW LOWER LIMIT	FLOW_LO_LIM
151		FLOAT (4BYTES)
	FLOW UPPER LIMIT	FLOW_UP_LIM
		FLOAT (4BYTES)
	READ CAL TEMP. LIMITS	
154	TEMPERATURE LOWER LIMITS	TEMP_LO_LIM
		FLOAT (4BYTES)
	TEMPERATURE UPPER LIMITS	TEMP_UP_LIM
		FLOAT (4BYTES)
	READ CAL PRESS. LIMITS	
	PRESSURE LOWER LIMIT	PRESS_LO_LIM
157		FLOAT (4BYTES)
	PRESSURE UPPER LIMIT	PRESS_UP_LIM
		FLOAT (4BYTES)

VALUE DESCRIPTION COMMANDS 6 Zero for pooling add., loop current mode 1 Zero= default address Loop current- 1=enable, 0=disable 17 24 bytes Write any message to the device 18 21 bytes 0-5 bytes=Tag 6-17=Descriptor 18-20=date 19 3 bytes Write final assembly number to the device 22 32 bytes Write 32-byte long tag 35 9 bytes 0=upper & lower range values unit code 1-4=upper range value 5-8=lower range value The device is placed in fixed current mode with the 40 4 bytes loop current set to the value received 42 Reset the device before slave time out 44 1 byte Select the units in which the primary variable & its range will be returned 4 bytes Trim the zero or lower end point value of the loop 45 current exactly to its minimum 46 4 bytes Trim the gain or upper end point value of the loop current exactly to its maximum Assigns device variables to the PV, SV, TV and QV 51 4 bytes 139 1 byte 0=disable totalizer 1=enable totalizer Write customer engineering units for Flow, Tempera-146 4 bytes ture, Totalizer and Pressure 149 9 bytes 0-3= Plenum height value 4-7= Plenum width value 8= Plenum unit code 150 1 byte 0= Disable write protect 1= Enable write protect 159 1 byte Write factory restore 160 5 bytes 0-1= DAC settings for 4mA 2-3= DAC settings for 20mA 4= Channel #1 out variable 161 0-1= DAC settings for 4mA 5 bytes 2-3= DAC settings for 20mA 4= Channel #2 out variable 0-1= DAC settings for 4mA 162 5 bytes 2-3= DAC settings for 20mA 4= Channel #3 out variable

Description of Write Commands

ST100 HART DTM

The ST100 product of family supports FDT-DTM Functionality through the HART Protocol 7.3. Fluid Components International provides DTM files for the ST100 HART device. This chapter describes the following:

- What is FDT-DTM Technology
- How it works with ST100 HART device
- Examples/Screenshots for ST100 HART DTM

What is FDT-DTM Technology?

Field devices have gained intelligence along with the spread of digital communication. As the number of intelligent devices increases, the more complicated settings and adjustments needed to use the advance functions in such devices. FDT (Field Device Tool) is a software architecture that lets field devices be set and adjusted in an open framework independent of a specific host system. FDT standardizes the communication and configuration interface between all field devices and host systems. FDT provides a common environment for accessing the device's most sophisticated features.

DTM stands for Device Type Manager, which at its core is a device driver. There are two DTM categories.

1. Device DTMs which connect to the field device configuration components

2. Communication DTMs which connect to the software communication components.

The DTM provides a unified structure for accessing device parameters, configuring and operating the devices, and diagnosing problems. DTMs can range from a simple Graphical User Interface for setting device parameters to a highly sophisticated application capable of performing complex real-time calculations for diagnosis and maintenance purposes.

How it works with the ST100 HART device?

The relationship between the FDT frame application and DTM is similar to that between the Windows Office application and Printer driver. A dedicated printer driver is provided for each printer and a standard interface is available in each printer driver. The Office applications can print data on any printer via this standard interface. In FDT, a DTM driver specific to a field device is provided and a standard interface is available in this driver. FDT frame applications such as the engineering system and asset management system can use the field devices via the FDT interface.



Figure 6 - Device Driver/FDT Device Manager Example

ST100 HART DTM Installation and Setup examples

In the installation process, there are three basic software components required: 1) FDT frame software such as PACTware, 2) an executable DTM file from the manufacturer (FCI) and 3) Comm_DTM for HART protocol communication.

Install device DTM prior to PACTWare and Comm_DTM components. Once device DTM is downloaded successfully run it on the PC. After that download and install Comm_DTM onto the system.

Below figure shows the basic setup requirements for ST100 HART DTM.



Figure 7 - Basic Setup Requirements, ST100 HART DTM

Once all three software components are downloaded and installed, the ST100 HART DTM should appear through the PACT-ware™ application as shown in the figure below.



Now invoke PACTware program. Select device from the menu and click on "Add Device" tab.



Right click on the device and select "Parameter", change correct COM port for HART modem.

PACTwa	re						
File Edit	View	w Project	Device	Extras	Window	Help	
🗅 💕 6	6	00 - 00	-0 I E	91 19	10 12	1	
Project			4 ×				
Device tag							
COM1	_					_	
	-36	Connect					
	-35	Disconnect					
		Get device st	tate				
	刷出	Load from de	evice.				
	브로	Store to dev	ice.				
		Parameter					
		Measured va	dum				
		Liagnosis				_	
		Display chan	nels				
		Channels				•	
		Topology Sci	30				
		Line (Courolos	d Manager				
		Print	of a real congress				
		Additional fu	nctions			•	
	19	Add device					
		Exchange de	vice				
	-39	Delete devic					
		Properties <	COM1 >HAI	RT Commu	nication		
	-					_	



Right click on the device and add "Device DTM" from the list.



🖻 🚊 All Devices	All Devices	All Devices			
Device	Device		Protocol	Vendor	
🖵 🍷 Driver	E3 Modulevel		HART	Magnetrol	
	Enhanced Jupiter		HART	Magnetrol	
	ES II Modulevel V2		HART	Magnetrol	
	Seneric is HRT Device 4		HART	ifak system	
	Model 705 2x		HART	Magnetrol	
	Model 705 3x		HART	Magnetrol	
	Model RXS		HART	Magnetrol	
	🤗 ST100		HART	FCI	
Vendor Group Type Protocol					
Show unselected devices too	<				
All Devices	•				
				OK Cancel	

Right click on the device and click on the "Connect". Select "Online parameterization" pull-down menu command to check the communication between ST100 HART DTM and ST100 Field Device.

PACTware		
File Edit Wew Proje	ect Device Extras Window	Help
Project	9 X	
Device tag B HOST PC COM7		
• • \$T100	Connect Disconnect Get device state Load from device	
	Parameter	Parameterization
	Measured value Simulation Diagnosis Print	Online parameterization
2	Additional functions Add device Exchange device Delete device	
	Properties <0,5T100>5T100	

Once you are done with the previous steps, ST100 device will be detected through PACTware program.



How to get the information through ST100 HART DTM device

Device Information

ST100 HART DTM contains "Device Information" tab wich has all the basic information of the instrument such as manufacturer, model, device ID, serial number, tag, poll address and so on.

ST100 Device Information Process Data	Device Information Manufacturer	Fluid Components Internationa
Status Basic Setup Advance Setup	Model	ST100 Product of Family
	Dev id	0
	Device Serial Number	2y
	Tag	FEB2013
	Long tag	ST100 DEMO UNIT
	Poll addr	0
	Final asmbly num	0
	Num reg preams	5
	Descriptor	PUJAN SHAH
	Universal rev	7

Process Data

ST100 HART DTM file shows all process data variables on a single screen with the value and engineering units. This tab also shows current output value for the primary variable. The figure below shows example data for Flow Value, Temperature Value, Totalizer Value and Pressure Value.

P ST100 Online parameter	ization			
Device: ST1 Description: Mas	00 s Flow Meter with HART 7 interfa	ice		
 ■ ST100 Process Data Status Basic Setup Advance Setup 	Process Data Flow Rate Value Temperature Value Totalized Flow Pressure Value Current Output of PV	 (2) 9.74261 (2) 33.7 (2) 166479 (2) 0.000 (2) 8.436 	2.63	StdCult/s degF StdCult psiA mA

Staus

ST100 Status tab has all the possible fault/error for the core as well as for the ST100 meter front end (FE). This tab lets the customer or technician diagnose/troubleshoot meter issues.



Basic Setup

Basic Setup has various ST100 settings including Units, Plenum, and Totalizer, Factory Reset, Write Protection and PV Setup. Use this tab to select engineering units for Flow, Temperature and Pressure variables.

P ST100 Online parameter	ization			
Device: ST1 Description: Mas	00 s Flow Meter with HART 7 interface			
B - ST100	Units			
Process Data	CLI Flow Units	SCFS	~	
Basic Setup	CLI Temperature Units	DEG F	¥	
Pipe/Duct Dim Device Info	CLI Pressure Units	PsiA	~	
Totalzer Factory Resel Write protecti				
PV Setup Advance Setup				

Pipe/Duct Dimension

Use this tab to specify the height, width and/or diameter for the pipe/duct. Specify dimension units as inches or millimeters.

PACTware		
File Edit View Project Device Extras Window Hi Image: Im	ep erization 1100 ass Flow Meter with HART 7 interface	
ST100 Device Informatio Process Data Status Basic Setup Units Process Data Status Device Info Totalaer Pactory Resel Write protecti PV Setup Setup Advance Setup	Pipe/Duct Dimension Duct Height Value Pipe Diameter (Duct Width) Value Pipe Dimension Unit	inches inches

Advance Setup

Use this tab to change DAC values (per user requirements) and select an output variable (Flow, Temperature or Pressure) for any of the three channels.

ST100 Online parameter	ization	
Device: ST1 Description: Mar	00 s Flow Meter with HART 7 interface	
ST100 Device Informatio	Channel 1 Setup	
Process Data	Channel 1 DA Setting for 4mA	10000
Basic Setup	Channel 1 DA Setting for 20mA	60000
Configuratio Factory Calbr	Channel 1 Out Variable	Flow
	Channel 2 Setup	
	Channel 2 DA Setting for 4mA	0
	Channel 2 DA Setting for 20mA	0
	Channel 2 Out Variable	VH V
	Channel 3 Setup	
	Channel 3 DA Setting for 4mA	0
	Channel 3 DA Setting for 20mA	0
	Channel 3 Out Variable	Off 💌

ST100 HART PDM

The ST100 product of family supports PDM (Process Device Manager) functionality through the HART Protocol 7.3. Fluid Components International provides PDM files for the ST100 HART device.

Shown below are example screenshots for the ST100 HART_PDM.

FLT FLUID COMPONENTS	Unitarian To ST100 HeVT EDC Application
Been Hinton TO Bran TO Bran TO Bran TO Bran Marco Bra Adverse Bra	
Sarder Beengen	

Opening Screen

Maxdature Made Devalue Devalue Tag Langago Padabo Made Tag Langago Padabo Made Tag Langago Padabo Machine Devate Devate	 \$1130 Device Information (%) (anomalies think) Device Information 	FLUID COMP	ONENTS NAL LLC
	Neudaduter Nede Nede Deut Tag		

Device Information Screen



Process Data Screen

57100 - 57108 S		UID (FERM	COMPONEN NATIONAL L	TS LC
Device statue	Process applied to the promy vandels is substitutine spectrary links of the field device Process applied to the non-promy vandels is substitutine to generating links of the field device Process applied to the non-statute analysis Process applied to the non-statute analysis Process and analysis of the field device his account, or power has been removed and reapplied Process and analysis of the field device his account, or power has been removed and reapplied Process and the field device his account of the field device Process and the field device his account of the field device Process and the field device his account of the field device.	Operation Statue	Setua Deco Enr Bactoros Norhus False Heauror False Heauror False Heauror False Prov Supp fal Configuetto huid	
Operation Status	Decos Industro Faled Decos Initiation Faled Decos Tempetar Techy Res Search Far Connected Base Connected Techy Tables Overline Decision Connected Techy Tables Overline Decision Connected Techy Decision Connected Techy Techy Techy Decision Connected	Operation Statue	Efferent Communication Falue UEB Communication Falues Industrat Communication Falues Industrat Communication Falues Process Temperature Det Mis Link Process Temperature Det Mis Link Rev Senser Nation 11 Strated Rev Senser Nation 11 Open Rev Senser National	
Operation Statue:	Pine Sensor Instance R0 Open Pine Sensor AD Council Guided Res Linet Pine Sensor AD Council Guided Res Linet Pine Sensor AD Council Guide Res Linet Pine Sensor Spect Extended Sci Strate Linet Pine Sensor Spect Extended AD Councers Linet PE Composers Etime AD/ADC PE Composers Etime AD/ADC	Operation Statue	If Corporate InvKNI54 If Corporate InvKNI54 If Corporate InvKNI54 Sense A/O If Corporat InvGand Sense A/O If Corporat InvRead Sense A/O If Corporate InvRead Sense A/O If Corporate InvRMI0 Unided Fuel If Corporate InvRMI0 Unided Fuel If Corporate InvRMI0 Unided Fuel If Corporate InvRMI0 Unided Fuel If Corporate InvRMI0 Unided Fuel Fuel InvRMI Unided Fuel Fuel If Corporate InvRMI0 Unided Fuel If Corporate InvRMI0 Unided Fuel Fuel Fuel If Corporate InvRMI0 Unided Fuel Fuel Fuel Fuel Fuel Fuel Fuel Fuel	
Operation Statue:	FE Component Error - ARM 7 Data Alpost Frauk FE Component Error - ARM 7 Data Albort Frauk EC Component Error - ARM 7 Spoulas, NYT Frauk STACKO: Self Owerk Mode - Na Process Data Available			
Sandor	Nesager			Otes

Diagnostic Screen

Base Seto	FLUID COM	PONENTS
Units Pipe Device Hito Totalizer Facts Units Cut Rev Units C Cut Rev Units C Cut Temp, Units C Cut Temp, Units C Cut Temp, Units C Cut Press, Units C	y Revet Wile Protector PV Shue	7
Transfer Messages		Cose

Basic Setup Screen



Basic Screen - Pipe/Duct Information

S1100 - Advance Setup (So communication)	🚺 37150 - Advance Sebap (No communication)
FLUID COMPONENTS INTERNATIONAL LLC	FLUID COMPONENTS INTERNATIONAL LLC
ST100 Configuration ST100 Factory Calibration	ST100 Configuration ST100 Factory Calibration
ST100 Configuration	ST100 Factory Calibration
Channel 1 Setup	INSTRUMENT FLOW LIMITS
Channel 1 DA Setting for 4nA	Row Lower Link
Ohannel 1 DA Setting for 25nA	Row Upper Link:
Ohannel 1 Out Variable:	
	INSTRUMENT TEMPERATURE LIMITS
Orannel 2 Setup	Temp Lower Link:
Channel 2 DA Setting for 4nA:	Temp Upper Linit:
Orannel 2 DA Setting for 20nA	INSTRUMENT PRESSURE LIMITS
Ohannel 20ut Variable:	Press Lower Lind:
and disks	Pass lacer Lint
Ohannel 3 Setup	
Charves J DA Setting for 4HA.]	
Charved 3 DA Setting for 25mA	HARTAA
Channel 30ut Variable:	COMMUNICATION FOUNDATION
COMPOSICATION FOUNDATION	
Tornfor Messages Ooe	Transfer Messages

Advance Setup Screens

7				
Parameter	Value	Un	it Status	Name
COffline Root Menu				_
Device Information				
Manufacturer	Ruid Components International			manufac
Model	ST100 Product of Family			device_
Devid	1			device,
Device Serial Number				sDevice
Tag				tag
Long tag	ST100	1		longTag
Poll addr	1			poling,
Final asmbly num	1			final_as
Num reg preams	1			reques
Descriptor				descript
Universal rev	7			univers
Software rev	1			softwar
Hardware rev	1			hardwa
Basic Setup	1999-00- 1997-00-			
⊖Units			_	-
CLI Row Units	SCFS			eCUR
CLI Temp. Units	DEG C		_	oCUTe
CLI Press. Units	psA			eCUP
BPipe			_	
Pipe Height Value	1.0	ed.	limeter	Peru
Pipe Width (Diameter) Value	1.0	et al.	Imeter	Peru
Pipe Unit	milmeter			CUP
E Totalizer				-
Totalizer Dev Stat	Totalizer OFF			eTotal
Elivitite Protection			_	
Write protect	No			wite_p
E PV Setup			_	
PVia	Volume Row	12		primary
CLI Row Units	SCFS			eCURe
PV % mge	1.000	1		percent
Fie damp	1.000			RowDa
E Advance Setup				-
ST100 Configuration				
Channel 1 Setup				
Channel 1 DA Setting for 4mA	1			wChar
Channel 1 DA Setting for 20mA	1			wChan
Channel 1 Out Variable	Off			eCharr
Channel 2 Setup				

Live Data from ST100 HART Device Through PDM

HART Diagnostics

Device Status

Bit 0 ("Primary Variable Out of Limits") refers to the selected PV Dynamic Variable. This does not set bit 7, "Device Malfunction".

Bit 1 ("Non-Primary Variable Out of Limits") refers to the device variables Temperature and Pressure out of limits. This does not set bit 7, "Device Malfunction".

Bit 4 ("More Status Available" is set whenever a failure reported by a Command 48 status bit being set.

Extended Device Status

The Field Device cannot predict, in advance, when the maintenance will be required. This status byte is set to 1 (Maintenance Required) when a sensor break is detected.

Additional Device Status (Command #48)

Command #48 returns 25 bytes of data, with the following status information for status bytes 0 through 5. The remaining status bytes are reserved for future use.

Listed below are definitions for status bytes 0 through 5.

BIT	MEANING	CLASS	DEVICE STATUS BITS SET
0	Serious Device Error	Hardware	4
1	Electronics Hardware Failure	Hardware	4
2	Memory Error	Hardware	4
3	Measurement Failure	Hardware	4, 7
4	Maintenance Required	Hardware	4
5	FRAM Failure	Hardware	4
6	Power Supply Failure	Hardware	4
7	Configuration Invalid	Hardware	4

Status Byte 0

BIT	MEANING	CLASS	DEVICE STATUS BITS SET
0	Device Initialization Failed	Hardware	4
1	Device Not Initialized	Hardware	4
2	Electronic Temperature Too High	Hardware	4
3	Flow Sensor Failure	Hardware	4, 7
4	Flow Sensor Not Connected	Hardware	4,7
5	Sensor Communication Failure	Hardware	4
6	Totalizer Overflow	Hardware	4
7	Flow Is Out Of Range	Hardware	4

Status Byte 1

	1		1
BIT	MEANING	CLASS	DEVICE STATUS BITS SET
0	Ethernet Communication Failure	Hardware	4
1	USB Communications Failure	Hardware	4
2	Industrial Communication Protocol Fail	Hardware	4
3	Procees Temperature Over Max Limit	Hardware	4
4	Process Temperature Under Min Limit	Hardware	4
5	Flow Sensor Heater #1 Shorted	Hardware	4
6	Flow Sensor # 2 Shorted	Hardware	4
7	Flow Sensor #1 Open	Hardware	4

Status Byte 2

BIT	MEANING	CLASS	DEVICE STATUS BITS SET
0	Flow Sensor Heater #2 Open	Hardware	4
1	Flow Sensor A/D Counts Exceed Max Limit	Hardware	4
2	Flow Sensor A/D Counts Under Min Limit	Hardware	4
3	Flow Sensor Signal Exceeds 120% Limit	Hardware	4
4	Flow Sensor Signal Exceeds 100% Signal	Hardware	4
5	Flow Sensor Signal Exceeds A/D Limit	Hardware	4
6	FE Component Error – AD56 27	Hardware	4
7	FE Component Error – TMP100	Hardware	4

Status Byte 3

BIT	MEANING	CLASS	DEVICE STATUS BITS SET
0	FE Component Error – AD5754	Hardware	4
1	FE Component Error – ACT/REF Sensor A/D	Hardware	4
2	FE Component Error – Current Sensors A/D	Hardware	4
3	FE Component Error – GRND Ret & Pressure Sensor A/D	Hardware	4
4	FE Component Error – Heaters I Sensors A/D	Hardware	4
5	FE Component Error ARM7 Undefined Fault	Hardware	4
6	FE Component Error ARM7 SWI Fault	Hardware	4
7	FE Component Error ARM7 Prefetch Abort Faule	Hardware	4

Status Byte 4

BIT	MEANING	CLASS	DEVICE STATUS BITS SET
0	FE Component Error – ARM7 Data Abort Fault	Hardware	4
1	FE Component Error ARM7 FIQ Fault	Hardware	4
2	FE Component Error – ARM Spurious INT Fault	Hardware	4
3	STACK in Self Check Mode No Process Data Available		
4	Reserved		
5	Reserved		
6	Reserved		
7	Reserved		

Status Byte 5

"Not used" bits are always set to 0. The bits may be set as errors are detected. But these errors are not reported from "continuous background self-testing", but rather through "observation" of various conditions during normal operation. That is, no actual "self testing" is being "continuously" performed. But as errors are detected during normal operation, these will be reported.

ST100 Series HART

Technical Characteristics	echnical Characteristics		
Manufacture ID:	0XA67F		
Output Signal:	4 to 20 mA signal via a FSK modem/ HI311 HART PC Interface		
Data transmission rate:	1200Hz		
Signal coding:	Bell 202 Current (Physical layer)		
Supported communication:	Publisher, Subscriber		
HART Commands:	Universal Commands Common Practice Commands Manufacturer Specification Commands		
Certification:	Hart Communication Foundation Registered		
Register Features:	Alarms and Events Relays Muti-bit Alert Reporting Field Diagnostics		

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<u>Appendix A – Drawings</u>



Channel 1 HART Connection Before April 2012

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Appendix B - Customer Service / Technical Support

FCI provides full in-house technical support. Additional technical representation is also provided by FCI field representatives.

By Mail

Fluid Components International LLC 1755 La Costa Meadows Dr. San Marcos, CA 92078-5115 USA Attn: Customer Service Department

By Phone

Contact the area FCI regional representative. If a field representative is unable to be contacted or if a situation is unable to be resolved, contact the FCI Customer Service Department toll free at 1 (800) 854-1993.

By Fax

To describe problems in a graphical or pictorial manner, send a fax including a phone or fax number to the regional representative. Again, FCI is available by facsimile if all possibilities have been exhausted with the authorized factory representative. Our Fax number is 1 (760) 736-6250; it is available 7 days a week, 24 hours a day.

By E-Mail

FCI Customer Service can be contacted by e-mail at: techsupport@fluidcomponents.com.

Describe the problem in detail making sure a telephone number and best time to be contacted is stated in the e-mail.

International Support

For product information or product support outside the contiguous United States, Alaska, or Hawaii, contact your country's FCI International Representative or the one nearest to you.

After Hours Support

For product information visit FCI at www.fluidcomponents.com. For product support call 1 (800) 854-1993 and follow the prerecorded instructions.

Point of Contact

The point of contact for service, or return of equipment to FCI is your authorized FCI sales/service office. To locate the office nearest you, please go to www.fluidcomponents.com.



FCI's Complete Customer Commitment. Worldwide ISO 9001 and AS9100 Certified

Visit FCI on the Worldwide Web: www.fluidcomponents.com

FCI World Headquarters

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FCI Measurement and Control Technology (Beijing) Co., LTD | www.fluidcomponents.cn

Room 107, Xianfeng Building II, No.7 Kaituo Road, Shangdi IT Industry Base, Haidian District | Beijing 100085, P. R. China Phone: 86-10-82782381 Fax: 86-10-58851152

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